

## REMARKS

The above amendments and these remarks are responsive to the Office action dated June 3, 2005. Claims 1-7 are pending in the application. Claims 1-7 are rejected. In particular, claims 1-7 are rejected under 35 U.S.C. § 112, second paragraph; claims 1, 2, 5, and 7 are rejected under 35 U.S.C. § 102(b); and claims 2, 3, 4, and 6 are rejected under 35 U.S.C. § 103(a).

Applicants have canceled claim 7, and amended claims 1-6. In view of the above amendments and the following remarks, Applicants request reconsideration of the rejected claims.

### *Rejections under 35 U.S.C. § 112*

The Examiner has rejected claims 1-7 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter that the Applicants regard as the invention. The Examiner indicates that the language of claims 1-7 is incomplete for omitting essential elements. In particular, the Examiner indicates that the structure and orientation of the elements that "deviate from the rotational axis" is unclear.

Without acknowledging the propriety of the rejection, Applicants have amended claim 1 in order to more particularly define the invention. In particular, the relative positions and relative orientations between elements of the claimed ball end mill, particularly between the rotational axis of the tool main body and the cutting blade, have been clarified.

The amendment to claim 1 recites that a "cutting blade is disposed on a flat face parallel to the rotational axis" of the tool main body. Support for the amendment may be found in original claim 7, which is therefore canceled. Claim 1 is also generally supported by Figs. 1A-1C, and generally by the specification. Other amendments made to claims 1 to 6 as set out above are intended to further clarify the claimed subject matter.

Applicants suggest that, in view of the above amendments and remarks, claim 1 particularly and distinctly defines the claimed subject matter. Applicants therefore request the withdrawal of the rejection of claims 1-6 under 35 U.S.C. § 112, second paragraph.

#### **Rejections under 35 USC § 102**

Claims 1, 2, 5, and 7 are rejected under 35 U.S.C. § 102(b) as being anticipated by DE 196 09 904 A1 (Ryoko Seiki Co.), hereafter referred to as DE '904. The Examiner suggests that the cited reference discloses all of the subject matter as set forth in the claims and is identical to the invention as broadly recited. Applicants respectfully disagree and traverse the rejection.

Claim 1, as presently amended, recites the following features (a) and (b).

(a) The ball end mill includes: a tool main body which rotates around a rotational axis thereof; a cutting blade section provided at a tip of the tool main body; a cutting blade which is formed at a tip of the cutting blade section, and has a substantially semi-circular shape; and a rake face and a flank, which are provided on either side of the cutting blade.

(b) The cutting blade is disposed on a flat face parallel to the rotational axis, and the flat face is shifted from the rotational axis by a predetermined distance when the flat face is viewed along the rotational axis.

As a result of feature (b), the ball end mill of claim 1 presents several advantages:

“According to this invention, since the cutting blade deviates from the rotational axis by the predetermined distance, any position on the cutting blade has a circumferential speed with respect to a work material. Consequently, *cutting resistance decreases, and therefore, abrasion of the cutting blade is reduced and breakage of the cutting blade is prevented.* Furthermore, *since cutting residue near the rotational axis can be cut away by the movement of the tool, the workface is finished with high precision.* In addition, at the time of cutting, the cutting blade positions backward of the rotational axis in one rotational direction, and positions forward of the rotational axis in the other. Therefore, the cutting blade acts as a type of cutting blade having edges at unequal interval, and *resonance of the cutting blade is reduced and reduction of precision of the cutting surface due to resonance is prevented.*” (at the specification from page 2, line 22 to page 3, line 1, emphasis added).

In contrast, as discussed previously, the DE '904 reference describes a ball end mill with a disposable cutting tip located on plate 8, which is retained in a cutout 2 at the end of a tool main body 1. As shown in Figure 2 of DE '904, the cutting edge is centered on plate 8, and plate 8 is inserted into the tool main body 1 so that the centerline of plate 8 agrees with the centerline of the tool main body, as shown in Figure 6. The cutting blade on plate 8 does not deviate from the rotational axis of the tool. Feature (b) of the claimed ball end mill is not present in the ball end mill of the cited reference.

Further, as described in the abstract of Japanese Unexamined Patent Application, First Publication No. H08-252714, (the Japanese counterpart application of cited German Patent Application Publication No. DE019609904A1), an object of the DE '904 ball end

mill is to fix a tip to an end mill main body such that a centerline of the tip coincides with a centerline of the end mill main body. This object completely opposes the above-mentioned feature (b) of the present invention; and furthermore, feature (b) is not disclosed or suggested in DE019609904A1.

In order for a cited reference to anticipate a claim, it must disclose each and every element of the amended claim, as it is set out in the claim. For at least the reason that the DE '904 reference fails to disclose a ball end mill having a cutting blade disposed on a flat face parallel to the rotational axis of the tool main body, where the flat face is shifted from the rotational axis by a predetermined distance when the flat face is viewed along the rotational axis, Applicants suggest that claim 1, as amended, is not anticipated by DE019609904A1. As claims 2 and 5 depend from claim 1, Applicants suggest they are similarly not anticipated by the DE019609904A1 reference for at least the same reasons that claim 1 is not anticipated. Applicants suggest the rejection of claim 7 is now moot. Applicants therefore respectfully request that the rejection of claims 1, 2, and 5 under 35 U.S.C. § 102(b) be withdrawn.

#### Rejections under 35 USC § 103

Claims 2 and 6 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the DE019609904A1 reference.

With respect to claim 2, the Examiner suggests it would have been obvious to one having ordinary skill in the art at the time of the invention to use the claimed predetermined distance, since it appears that it would not have a major effect on the

efficiency and operation of the tool, and further since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. Applicants respectfully disagree.

As discussed above, the DE019609904A1 reference fails to disclose each and every element of claimed subject matter of claim 1. Applicants therefore suggest that the DE019609904A1 reference also fails to disclose each and every element of dependent claim 2. As discussed previously, as the cited reference fails to disclose any deviation of the cutting blade from the rotational axis, the reference necessarily fails to provide any motivation to vary the distance between the cutting blade and the rotational axis to discover an optimum range.

With respect to claim 6, the Examiner suggests it would have been obvious to use mirror polishing to round the blade since the use of such is old and well-known in the art. Again, Applicants suggest that as the DE019609904A1 reference fails to disclose the subject matter of claim 1, as amended, the DE019609904A1 reference necessarily fails to disclose each and every element of claim 6. In order to establish the *prima facie* obviousness of the rejected claims, the cited reference must disclose each and every element of the claims.

For at least these reasons, Applicants suggest the Examiner has failed to establish the *prima facie* obviousness of claims 2 and 6. In view of the amendments and remarks above, Applicants respectfully request the withdrawal of the rejection of claims 2 and 6 under 35 U.S.C. § 103.

The Examiner has rejected claims 3 and 4 under 35 U.S.C. § 103(a) as being

unpatentable over DE019609904A1 in view of Anjanappa et al. The Examiner suggests that it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the rake face and the flank face of the ball end mill of DE019609904A1 with different predetermined angles in the manner as taught by Anjanappa et al. in order to provide the tool with a different cutting option. Applicants traverse the rejection.

In order to establish the *prima facie* obviousness of the rejected claims, the cited references must disclose each and every element of the claims. As discussed above, the DE019609904A1 reference fails to disclose each and every element of claim 1, and so similarly fails to disclose each and every element of claims 3 and 4. Anjanappa et al. similarly fails to disclose or suggest the above-mentioned feature (b) of the claimed ball end mill.

Further, one of ordinary skill would not be led to combine the rake face and flank face of the Anjanappa et al. reference with a cutting edge that is offset from the rotational axis of the tool, because to do so would be to change the principle of operation of the Anjanappa et al. reference. There can be no suggestion or motivation to modify Anjanappa et al. to create a tool having a cutting blade which has a substantially semi-circular shape and is disposed a predetermined distance from the rotational axis, as such modification would change the principle of operation of the reference.

Further, there is no suggestion in Anjanappa et al. that such a modified ball end mill would possess the substantial advantages of the claimed ball end mill, in particular decreased cutting resistance, reduced abrasion and breakage of the cutting blade, the

ability to maintain a high precision finish on the workface, and reduced resonance of the cutting blade.

For at least these reasons, Applicants suggest the Examiner has failed to establish the *prima facie* obviousness of claims 3 and 4. In view of the amendments and remarks above, Applicants respectfully request the withdrawal of the rejection of claims 3 and 4 under 35 U.S.C. § 103.

It is now believed that the subject patent application has been placed in condition for allowance, and such action is respectfully requested. If the Examiner has any questions or concerns, or if a telephone interview would in any way advance prosecution of the application, please contact the undersigned agent of record.

The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 11-1540.

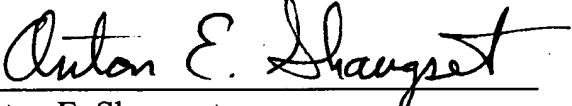
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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, postage prepaid, to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on August 29, 2005.

  
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